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Form Approved  
OMB No. 0704-0188

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<b>1. REPORT DATE (DD-MM-YYYY)</b> 07-05-2008		<b>2. REPORT TYPE</b> Final Report		<b>3. DATES COVERED (From - To)</b> July 07 - July 08	
<b>4. TITLE AND SUBTITLE</b> Implementation of an Electronic Medical Records System				<b>5a. CONTRACT NUMBER</b>	
				<b>5b. GRANT NUMBER</b>	
				<b>5c. PROGRAM ELEMENT NUMBER</b>	
<b>6. AUTHOR(S)</b> Fletcher, Chadwick B., CPT, Medical Service Corps				<b>5d. PROJECT NUMBER</b>	
				<b>5e. TASK NUMBER</b>	
				<b>5f. WORK UNIT NUMBER</b>	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b>  HHC AMEDD C&S Ft. Sam Houston, TX 78234				<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>	
<b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> Army Medical Department Center and School BLDG 2841 MCCS-HFB (Army-Baylor Program in Health and Business Administration) 3151 Scott Road, Suite 1411 Ft. Sam Houston, TX 78234				<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>	
				<b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b> 35-08	
<b>12. DISTRIBUTION / AVAILABILITY STATEMENT</b>  Approved for public release; distribution is unlimited					
<b>13. SUPPLEMENTARY NOTES</b>					
<b>14. ABSTRACT</b> <p>Delivery of excellent primary care—central to overall medical care—demands that providers have the necessary information when they provide care. This paper argues that provider and patient information and decision support needs can be satisfied only if primary care providers use electronic medical records (EMRs). Although robust EMRs are now available, only about 5% of U.S. primary care providers use them. Recently, with only modest investments, Australia, New Zealand, and England have achieved major breakthroughs in implementing an Electronic Medical Records System in primary care. Substantial benefits are realized through routine use of electronic medical records include improved quality, safety, and efficiency, along with the increased ability to conduct education and research. Nevertheless, barriers to adoption exist and must be overcome. Implementing specific policies can accelerate utilization of EMRs in the U.S.</p> <p>The Electronic Medical Record is the future of our healthcare system. The evidence suggests that by adopting and implementing an EMR system, healthcare organizations can deliver high quality and efficient healthcare in hospitals and independent provider practices. Ultimately, the organization will provide the patient with the highest possible care and most likely lifesaving treatment</p>					
<b>15. SUBJECT TERMS</b> Electronic Medical Record, Electronic Health Record, EMR, EHR					
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b>  U	<b>18. NUMBER OF PAGES</b>  66	<b>19a. NAME OF RESPONSIBLE PERSON</b> Education Technician
<b>a. REPORT</b> U	<b>b. ABSTRACT</b> U	<b>c. THIS PAGE</b> U			<b>19b. TELEPHONE NUMBER (include area code)</b> 210-221-6443

Electronic Medical Records Implementation

Army-Baylor Graduate Program in Health and Business Administration

Implementation of an Electronic  
Medical Records System

Graduate Management Project

Submitted to Major(P) Lee Bewley, PhD, FACHE

In partial fulfillment of the requirements for Degrees in Health and Business  
Administration

May 2008

CPT Chadwick B. Fletcher, M.Ed, CPHIMS

Administrative Resident

U.S. Army Medical Department Center and School

**20090210067**

Acknowledgements

First and foremost, I would like to thank my family for all the love and support they have given me; not only during this program but through out my entire career. Darla, I know I have bounced you all over the world but I am truly grateful for all that you have sacrificed for my career...I love you. To Allyson, Aimee and Danielle, you girls are the greatest. There is nothing that I could ever do in life that would make me as proud as being your dad.

A heartfelt thanks to all of the people I have encountered in my life that have taken me under their wing, mentored me, and called me friend. These include, but are not limited to, my grandfather Charles Bartley, Mr. Mike Weber, LTC Bruce Upton, and MAJ Anthony Schuster. Finally, CPT Steven Stovall, you have been my sounding board, my comrade, and my friend. Thank you all for pushing me beyond myself and making me see all that I can accomplish.

I would like to express my appreciation to the following people who have made my residency year as smooth as it could be. First, thanks to COL Joseph Harmon, my preceptor. Thank you for being there anytime I had an idea to bounce off of you. You always seemed to have the right advice to help me with any project. Enjoy your retirement and remember...Go Big Orange. LTC Lemaster, thank you for giving me the freedom to search out healthcare facilities and visit them anytime. That freedom allowed me to see multiple areas of the MHS and civilian healthcare system and how these organizations operate. It was because of both of you that my residency was the experience it was. Thank you again.

I would also like to thank the faculty and staff of the Army Baylor Graduate Program in Health and Business Administration. These great Americans have performed above and beyond the call of duty to not only better the class as individuals but as a team. In return, their selflessness and dedication to the call ensures that the Military Healthcare System will continue to be on the cutting edge of excellence.

A final thanks to "The Finches". Although we are from different backgrounds, we became and are a family. MAJ Andrew Hartman, MAJ Roddex Barlow, CPT Christopher Besser and Capt Michael Emerson...thank you I am truly honored to call each of you my friends.



### **Abstract**

Delivery of excellent primary care—central to overall medical care—demands that providers have the necessary information when they provide care. This paper argues that provider and patient information and decision support needs can be satisfied only if primary care providers use electronic medical records (EMRs). Although robust EMRs are now available, only about 5% of U.S. primary care providers use them. Recently, with only modest investments, Australia, New Zealand, and England have achieved major breakthroughs in implementing an Electronic Medical Records System in primary care. Substantial benefits are realized through routine use of electronic medical records include improved quality, safety, and efficiency, along with the increased ability to conduct education and research. Nevertheless, barriers to adoption exist and must be overcome. Implementing specific policies can accelerate utilization of EMRs in the U.S.

The Electronic Medical Record is the future of our healthcare system. The evidence suggests that by adopting and implementing an EMR system, healthcare organizations can deliver high quality and efficient healthcare in hospitals and independent provider practices. Ultimately, the organization will provide the patient with the highest possible care and most likely lifesaving treatment.

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*"In an attempt to arrive at the truth I have applied everywhere for information but in scarcely an instance have I been able to obtain hospital records fit for any purpose of comparison. If they could be obtained they would enable us to answer many questions. They would show subscribers how their money was being spent, what amount of good was really being done with it or whether the money was not doing mischief rather than good."*

*Florence Nightingale, 1863*

## EXECUTIVE SUMMARY

The President of the United States Executive Order issued in April 2004 calls for widespread use of electronic medical records for all Americans by the year 2014. Yet adoption rates for this technology remain surprisingly low. The CDC's National Center for Health Statistics announced in the summer of 2006 that while almost one quarter of the nation's physicians (23.9 percent) reported using full or partial electronic medical records (EMRs) in their office-based practice, just one in ten physicians (9.3 percent) used EMRs with the four basic functions (e-prescribing, computerized provider order entry, automated reporting of test results, and physician documentation) considered necessary for a complete EMR system. Many researchers and groups, including the HIMSS Global Task Force, have examined existing barriers that hinder EMR adoption. In the United States and in other countries, four common barriers have been identified: communication, standardization, funding and interoperability. This paper will look at other organizations and how they have adopted and implemented the Electronic Medical Record. It is the knowledge that we will gain from this that we will use to guide how we implement the EMR at our own facility. While some of these other practices have clearly struggled to become paperless, others have enjoyed great success.



The different aspects of EMR implementation addressed in this paper include what to do with the paper record; choosing appropriate technology; project management; configuration needs; training needs; the case for quality; and return on investment.

## INTRODUCTION

### Background

Envision that as a new patient, you never again had to fill out paper forms each time you went to the doctor's office. What if your entire medical history and records, from birth to death, was available to you and any healthcare provider you authorized...at any time? What if you never had to carry another handwritten prescription to the pharmacist only to have them call the doctor's office because they could not read it? What if you did not have to go through repetitive medical procedures because the previous results were unknown or not accessible? Although this may sound like science fiction, it is not. All of these things and more can be accomplished through the use of Electronic Medical Records (EMRs) Systems.

Over the past 20 years or so, significant advancements have been made in the delivery of healthcare. With the advancements in healthcare delivery and the desire to provide excellent primary care, the complexity of healthcare has increase and presented new problems to healthcare providers. In order to provide excellent care to their patients, providers must have access to the necessary medical information on their patients and their previous medical history.

Capitalizing on progress made in the informational technology realm, which include more powerful computers, high-speed inter and intranets and advancements in

software design, providers have the ability to access an increased amount of electronic health information. However, the availability of this information is not always organized or accessible by all physicians. This information is also not “systemized” or it is only available in paper form. The increased availability of vital patient data offers a tremendous amount of support to healthcare professionals in the conduct of their day to day duties. This information can be used to provide more efficient care, reduce patient errors, assist in research and overall help save lives.

Due to the increased complexity of healthcare over the years, it has become more and more likely that healthcare providers will not be fully informed about patients' previous and present health status and current treatments. Unfortunately, practicing healthcare in this manner, with lack of information, has become the rule and not the exception.

However, Health Information Systems (HIS) have advanced to a qualitatively new and higher performance level. Now the idea of a records system that provides healthcare professionals timely and efficient access to a patient's complete health history has become a reality.

The availability of relevant data offers tremendous opportunities such as supporting health care professionals in their day-to-day activities and research work, reducing clinical errors, and increasing the quality of health care provided. It is evident that the use of information technology in health care may offer also associated complications<sup>1</sup>. For example, modern information technology systems are expensive. The providers may spend more time with the computer than with the patient, and possibly, when insufficiently designed, system failures may cause negative affects on patients and health professionals.

### **Problem Statement**

With the continued growth in the healthcare industry and the advancements in healthcare technology, healthcare organizations and providers must find a way to effectively and systematically manage patient information. At present, the United States Healthcare System, as a whole, performs less than stellar in the management of patient information. This lack of information management, or information mismanagement, can lead to numerous patient problems that include including misdiagnosis, useless and repetitive procedures performed and quite possibly death. As we move closer to perfect patient information management, the healthcare industry must greatly increase the likelihood of optimal results for their patient and the providers. By implementing an Electronic Medical Records System, the healthcare organization takes a step in the right direction in order to achieve perfect patient information management.

### **Purpose**

The purpose of this paper is to describe the current situation with the Electronic Medical Records System in the US Healthcare industry, to identify some of the challenges and to strategically lay out a basic plan for the implementation of an Electronic Medical Records System that can be adopted at any healthcare level.

### **Literature Review**

*"Healthcare is in need of an industrial revolution. To reform healthcare delivery, to improve its quality, to stabilize its costs, we must have access to data, reliable data, shared data. The only viable source of the data is the computer. Patients' medical records need to be computerized. A well-connected, fully interoperable computerized system should be a major government goal, with appropriate funding to support it."*

George Halvorson  
CEO  
Kaiser Permanente

### **Traditional versus Electronic Records**

The limitations described are mostly those when compared to Electronic Medical Records. Paper based medical records can have a negative impact on optimization of information management in health care and as a result can reduce productivity and degrade the quality of care provided. Productivity may be decreased because the paper medical records are often unavailable at the time of treatment, important information may not be written on them, or the handwriting of a health professional may not be readable. Wasting of time is another important issue. Gaining access to the paper records may be a time-consuming task, since a paper record can be in only one place at a time, and it can not be shared between two or more providers from different places at the same time.

Often times information in the paper record is either duplicated or omitted, by health professionals from different departments because of the lack of coordination between these providers, or during the time spans the record remains in the same department.

Paper records may also negatively influence the quality of care provided to a patient. Sometimes physicians have to deal with information regarding their patients' medications or preventive services in the form of lists or registries. The information in the records may be sometimes duplicated and even contradictory in different lists or charts. As a result, the physicians can not keep track of patients' problems and the quality of care may suffer.

Another disadvantage of paper based medical records is that they do not provide reminders for health professionals or patients that are needed for preventive services or disease monitoring. They also do not also offer point-of-care decision support or support



for practice guidelines, test ordering, drug prescribing, drug-drug interactions, encounter documentation and other actions.

Paper records restrict optimal quality assurance and quality improvement activities and research. It is very difficult and time consuming, or sometimes near impossible to get data on processes and outcomes that are vital for bench-marking, or data for research purpose, from paper records.

### **What is an Electronic Medical Record?**

Electronic Medical Records (EMRs) consist of both hardware and software applications that provide integrated, longitudinal views of a patient's data. The information that must be included in EMRs is demographic and health records, at a minimum. EMRs would utilize several software applications in a networked environment, including clinical decision support (CDS), physician order entry (POE), integrated communication with laboratories, imaging centers and other facilities and would include population health management. The Australian Electronic Medical Records Taskforce Report provides a definition of EMRs that includes all the components of comprehensive and inclusive EMRs model: "An electronic record is a longitudinal collection of personal health information, usually based on the individual, entered or accepted by health care providers, which can be distributed over a number of sites or aggregated at a particular source".<sup>2</sup> The information is organized primarily to support continuing, efficient and quality health care. The record is under the control of the healthcare provider and must be stored and transmitted securely.



Comprehensive and accessible Electronic Medical Records have long been considered the "holy grail" of health information technology (IT) development.<sup>3</sup>

Electronic Medical Records that represent electronic storage and immediate availability of information to authorized practitioners is often combined with the advantages of an electronic healthcare system, including enhanced access to medical information and a greater efficiency. There are such opinions that full access to health information might bring cures for certain diseases, such as AIDS.<sup>4</sup>

Electronic Medical Records make possible the sharing of data by electronic information exchange and lead to the standardization of medical documentation and better information management. A major source of medical errors is handwriting legibility. Paper medical records are not always properly transcribed and sometimes illegible prescriptions and medication orders that may result in side effects or drug interactions may occur. Even so, the key benefit of EMR system is not that they require computer entry but that they streamline the processes. The most successful EMR systems improve workflow and efficiencies, enabling better management of the patient care process.

As the healthcare field is getting more complex and more specialists are involved in patients' care, paper records cannot keep practitioners completely informed. Records must be available electronically so that these providers can easily access and review a patient's history, including allergies and medication use, investigation and laboratory tests performed, and thereby to be able to deliver the best care possible.

There are several terms used for the electronic tools that replace paper medical records. The term EMR is accepted globally as the generic term for the vision of

electronic patient care systems. Nevertheless, terms such as CPR (computer-based patient record) and EMR (electronic medical record) continue to be used in some circles, adding to the confusion. The main difference between CPR and EMR is that the first does not necessarily contain all information from birth to death but focuses on relevant information for current or future care.

EMRs are known by various terms, each indicating a specific vision that differs from the others (see "Definitions" in the Annex 1). Some ten years ago the term computer-based patient record (CPR) was very common. Today, most provider organizations are working on electronic medical records (EMRs).

Electronic Medical Record is an electronic healthcare information record referencing one patient with full interoperability and integration within a single Enterprise. An Enterprise may be a clinic, hospital, health plan, or a health authority. This makes EMR different from EMR in that it is not limited to one health care organization. The goal for many providers is to create complete interoperability among all departmental systems. EMRs are based on special software linked in a networked environment between departments and services of an Enterprise, and usually they are not interconnected with similar electronic systems from other enterprises.

### **Advantages of the Electronic Medical Records System**

One of the most important advantages of EMRs is the accessibility of information. Physicians have the ability to search across multiple databases to retrieve patient data. Searching and accessing medical information in electronic medical records system becomes easier and less time consuming. Since the information is electronically entered

into the system, it can be simultaneously accessed by several authorized users in different locations connected to the network. The quality of information is also improved. The limitations on information such as missing pieces of data or handwriting legibility are greatly, if not totally, eliminated. The EMR databases can be accessed by authorized users through Internet or other communications systems. Physicians can now be able to see or add their records at the hospital, at home, or even while traveling.

A survey conducted by the Medical Records Institute, Newton[5], shows that providers rank the ability to share a patients' health record among healthcare practitioners and professionals within the enterprise as the number one benefit of EMRs, followed by better quality of care, improved clinical processes or workflow efficiency and clinical data capture, and reduction of medical errors.

There are also productivity advantages of an electronic medical records system. Physicians could access the information regarding the patient's history of disease prior to the patient's visit. Locating information in a computerized form is easier and more simplified since records can be searched and displayed by different parameters, as chronologically, by group of indicators, by problem and by provider. Laboratory data can be displayed in text form, graphically, or in table form that is easier to interpret.

An Electronic Medical Records System can incorporate a clinical decision support system. The model for clinical decision support systems in Figure 1 illustrates how alerts, used in clinical decision support systems, should aide in problem recognition and should lead to clinical actions that improve patient outcomes.<sup>21</sup>

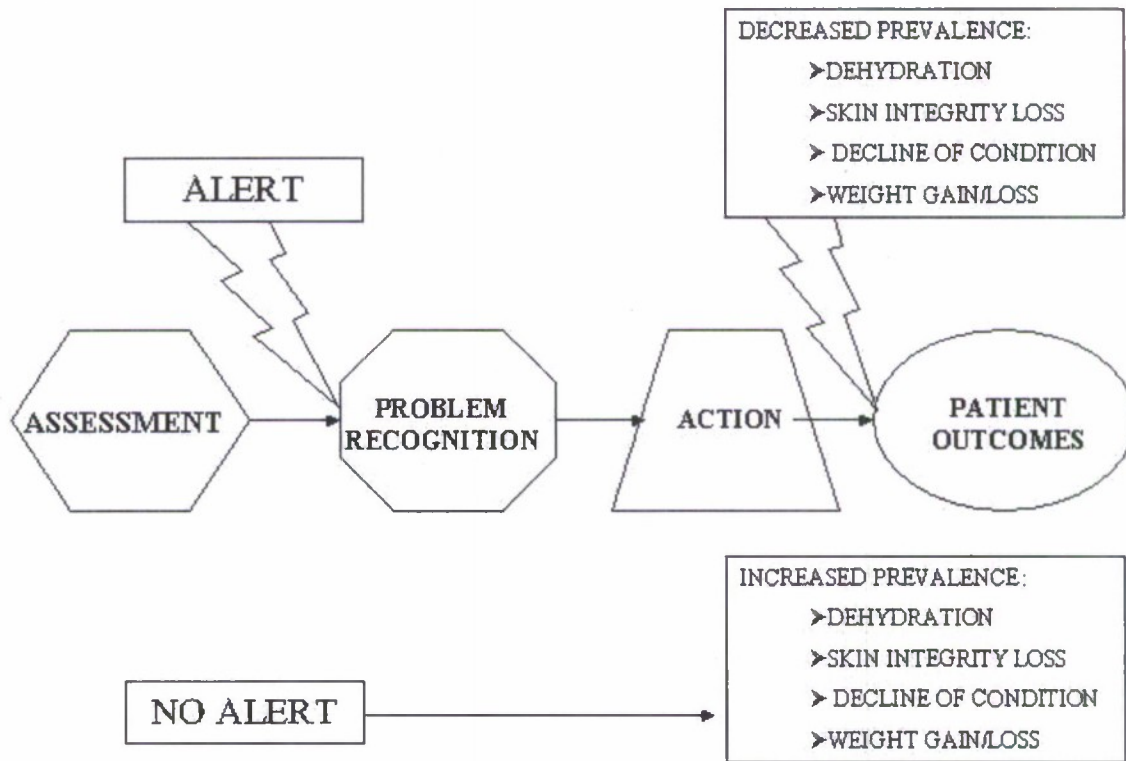


Figure 1. A Model for Clinical Support Decisions in an EMR

Electronic reminders are another tool that has become available within the EMRs. These reminders, or flags, are very important tools for healthcare professionals. These reminders can be useful in preventive services, disease monitoring, and treatment control. For example, the EMR system could remind the physician when the patient should receive the next dose of medication or have a certain type of test. The input of data in an EMR is much simpler. One such example is with prescriptions. No longer does a patient have to wait for multiple prescriptions. The provider can enter these prescriptions once and then transmit the order to the patient's pharmacy. When the patient needs a refill on a certain prescription, the physician is able to pull up the medication history and



reorder the drug quickly. This is also a safety issue. The EMR can be set up with flags to show negative drug interactions. This will prevent the physician from writing prescriptions for drugs with adverse reactions to each other.

Support tools can assist health professionals with direct visit note entry thus eliminating or reducing both the cost and time delays associated with dictation and data transcription. Plus, electronic records can simplify the process even when charts are dictated and transcribed, since notes to be reviewed can be flagged, read, and edited electronically.

Administrative tasks are also simplified. Internal messaging within the EMR system can reduce time-consuming "phone tag" and manual chart transfers. If a nurse or data transcriptionist has a question, they can enter it into the EMR system. When the provider logs on to the network, a notice is displayed. The provider can then make the necessary correction to the patients' record.

Electronic records could easily offer diverse type of data in the form of selected variables. These variables can be selected or changed for quality assurance and quality improvement or for research activities. Quality management and improvement activities are greatly eased, since practice-level process and outcome data is readily accessible. Electronic medical record systems offer the opportunity to generate information reports for administrative, financial, and evaluation purposes. Results-reporting functions can help ensure that abnormal findings are addressed.



### **Barriers of the Electronic Medical Records System**

There are several barriers that exist in the implementation of an Electronic Medical Records System. These barriers range from financial, to policy issues, to physicians protecting their "turf". However, none of these barriers are so great that they are insurmountable or justify not to implement an electronic medical records system. One of, if not the main, barriers of adopting an EMR system is the costs. The 1991 Institute of Medicine Report on the Computerized Patient Record (CPR) suggested that "the cost of the CPR system should be shared by those who benefit from the value of the CPR." That being said, many of the financial benefits of an EMR system will be seen by third-party payers and the purchasers of health care rather than the providers of the health and the health care groups that invest in these providers. However, there are a few large organizations that have seen benefits from wide scale investing in EMR systems. These include Kaiser and Group Health. However, the majority of the providers that will use EMRs are private practitioners and those part of smaller provider groups and will bear most, if not all, of the cost to implement the system.

The federal government has recognized that some sort of financial assistance or reimbursement must be provided to those providers that do implement an EMR system. However, due to the current federal deficit and other issues, specifically the Global War on Terrorism, competition for these limited funds is outstanding. In the long run, federal financial incentive for these providers to implement an EMR system falls by the side of the road.

Another major barrier to the implementation of Electronic Medical Records systems is the physicians themselves. Some physicians believe that using an Electronic Medical Records system will have a great negative impact on their work flow. These impacts will be seen in their data collection and conversion.<sup>7</sup>

There are two primary problems related to the type of information that is collected by physicians. The first problem is the translation of "free-text" notes into a language and structure that the computer based system can understand. As it stands today, many physician notes are stored in various computer systems via dictation and transcription. It is safe to assume that one day all notes will be stored into some type of computer based system. The question then arises, how will the new EMR system be able to convert this legacy information into the new system? How will the new system code it? At what point is data carried forward into the new system and what data is archived in legacy form? Having staff go back and code the physician's notes and dictation into a new system can lead to secondary human coding errors. Even today, with the current systems in place, re-coding is an expensive operation. Expensive, not only in personnel cost but also in error costs. Despite decades of systems improvement, computers cannot accurately interpret unconstrained text. The only option that is left, at the present time, is for the physician or their staff to go back and re-enter or re-code their patient's information.

Entering structured data requires more user time than entry of free-text information. Entering this type of data, at least in the beginning of the systems lifecycle, requires the user to select the correct code or phrasing that the computer understands. The computer based system often requires more specific types of information than the

user may know. This type of information, as compared to entering free-text and voice data, is a major consumer of the physician's and their staff's time.

The second problem is that much of the data that administrators and analysts would like to have (e.g., formal function status and detailed guideline criteria) are not provided in any form (narrative or coded) in the current physicians notes. Further, we do not know exactly how much information is really needed. For some procedures, such as a knee replacement surgery, data sets have been developed. However, for most subject areas, we have not even proposed, let alone tested and refined, a data set. This leaves the provider with the responsibility of developing their own procedures profile. Therefore, there are no standard procedural data sets that can be shared across the healthcare community.

How do we define and collect the "soft" data elements that are described in providers' notes? Can we define each and every variable as a formal survey question? If so, each different way of stating the question and each different set of response answers defines a distinct variable. Although validated survey instruments exist for some subject matters (e.g., alcoholism, Depression, general health status), we lack them for many subjects and for most of specialized clinical care. Another concern is that checklist symptom questionnaires elicit many more (and less important) symptoms than open-entry questions, and it is difficult to know how to interpret this difference. The EMR system must be able to differentiate between patient-completed and provider-completed questionnaires.

Until a system is developed that will translate the survey data into accurate structured data, we will have to live with a mixture of coded and free-text information. The

challenge for healthcare providers will be to find where to draw the line. What categories of information are valuable enough to justify coding, and what can be left as free text? What level of granularity is required? These are questions that could be answered empirically but require considerable work.

Whatever type of system that is adopted, it **must** be able to meet the productivity demands of the physician. The system can not be a burden on the physicians time and should limit the amount of time needed for the physician to enter the necessary data. Although, one would expect to see a more complete set of patient data entered on their first visit, this could be done by allowing the patient to directly enter this data into the system via a health survey kiosk. The data would then be imported into the patient's EMR. By having the patient enter this data, the provider will have more time to practice medicine and limit their time for inputting historical data.

### **Impacts of an Electronic Medical Record**

*"If everyone wants EMRs and the sources of patient data are so abundant, why are EMRs so scarce?" (Clement J. McDonald, MD)<sup>6</sup>*

The US Institute of Medicine<sup>7</sup> noted that the development if EMRs should strive to improve patient safety, support the delivery of effective patient care, facilitate management of chronic conditions, improve efficiency and be feasible to implement.

With the exception of a few contrary reports showing negative results,<sup>8,9</sup> the majority of case studies from a wide spectrum of practice settings describe the successful application of an EMR system.<sup>10-12</sup>



The extensive use of EMRs, accessible to all professionals dealing with patient's treatment or consultation, would substantially improve the co-ordination and quality of health care. There is increasing evidence of the clinical value of EMR systems.<sup>6, 11-16</sup> EMRs may provide clinical decision making support functions, particularly the capability to promote an adherence to guidelines in diagnosis, treatment and prescribing. The system will "flag" or warn the provider if treatments fall outside of acceptable protocols.

EMRs increase health care efficiency by providing collective regional and national data and improving co-operation between various health professionals. The electronic medical records system gives the possibility for multiple physicians to easily access the same patient's record for purposes of consultation or cross-coverage.

Patient safety is expected to be increased. This benefit is accomplished by the use of electronic treatment and prescription flags. The reminder function will also ensure that the patient receives the necessary treatment at the required time. Utilization of such systems have been found to reduce the prescription costs, through encouraging generic prescribing, to reduce costs of test ordering and to improve health promotion interventions.<sup>17</sup>

With the implementation of EMRs, more attention will be paid to primary care and focusing towards a more holistic, proactive, disease management style of practice. There is a tendency noted in the literature toward enabling patient self-care. The possibility of a patient accessing their health records through Internet gives the patients new opportunities to better understand their health status and to convey the self-management skills that would make them more effective partners in their health. The information from electronic medical records accessible through the internet should be specially adapted for



patients. This information intelligently combined with personalized health information that is formatted to patients needs, such as patient orientated EMRs, would assist patients to make informed decisions about their care. Educated and empowered patients would demand and help ensure a health care system that is high performing, consistent, safe and dependable.

There are a number of concerns regarding the use of comprehensive EMRs. One of the important concerns is the privacy of information. Some sustain that once the medical information is stored electronically it can be easily shared with many parties. Others say that there is also evidence of sharing paper based records and we do not have to be very concerned about it especially if all measures of data security are respected within EMRs systems. Regardless, the provider or facility that adopts an EMR system must take the necessary precautions to ensure patient data security. This usually means the hiring of information security personnel and the purchasing of specialized security equipment and software.

Predictable high cost, time involved, training of health care professionals, and the possibility that physicians will spend more time with computers than with the patient are also concerns related to implementation of an electronic medical records system.<sup>6, 8, 15</sup>

Several studies demonstrate that computer-based decision making support can improve physicians' performance, and in some instances, patient outcomes.<sup>15</sup> Access to the latest research enhances a clinician's ability to provide evidence-based care. A list of reports shows the favorable response that patients have to electronic records.<sup>15, 18-20</sup>

## Requirements of an Electronic Medical Records System

An electronic medical record system is often a confusing concept to grasp for physicians and health care administrators. The biggest reason for this is there are different views on the EMR among healthcare professionals. The difference in views may stem from the fact that there is no standardization among the medical field on what an electronic medical records system is. As a result, different executives are looking for different features in the EMR system that they select. There are numerous functional requirements of an electronic medical records system as can be seen in appendix B<sup>(22)</sup>. However, C. Peter Waegemann, from the Medical Records Institute, conducted a status report on electronic health records. The report gives a list of ten functions that an EMR should accomplish:

1. *Recording Function.* The recording function is often incorrectly considered the main function of an EMR system. This function has traditionally helped physicians remember details on patients serving as “aide-memoire”.
2. *Sharing Information.* As we increase the complexity of our healthcare system and continue to develop specialized providers, more providers are involved in the care and treatment of the same patient. As a result, information on that patient must be able to be shared by these providers. The sharing of this information reduces the opportunity for medical errors and helps to insure that we increase the quality of care that we provide our patients.
3. *Order Entry (POE).* The physician now has the ability to input patient orders directly into the system. This allows for a decrease in time that the patient has to wait for necessary procedures and help to ensure the accuracy of the

procedure that are to be performed.

4. *Retrieve-ability.* Having the ability to access **accurate** patient information is a key piece of the functionality of the EMR system. This is especially the true in the event that there is patient with lots of information. The treating physician is able to pull up all relevant information on the patient in dealing with the current treatment.
5. *Built-in Functionality.* Built in functionality is the key for Electronic Medical Record documentation. The providers or health care professionals to set identifiers for accessing health information. These identifiers help to ensure that information being retrieved is accurate and complete and falls within required time parameters. Simply, the EMR system can give the provider accurate and timely patient information.
6. *Authentication.* The EMR system should be able to identify the author of a patient encounter by a series of access control. Then upon completion of the patient encounter, the record can be digitally signed. Each authorized user of the EMR system will have a unique authentication security identifier.
7. *Audit Activities.* The EMR system must have activities built in that will allow for auditing and tracking of the patient records.
8. *Security.* Protected Health Information (PHI) should only be access by authorized parties in accordance with applicable laws. This security must be maintained not only at the health care facility, but also in the data lines that will transmit the data from provider to provider.
9. *Interaction with decision support systems.*

10. *Interoperability.* Any EMR system must have the ability to interact with another EMR system. At the present there is no standard protocol when engineers design an EMR system. There should be a set of standard in the development of the systems to ensure interoperability.

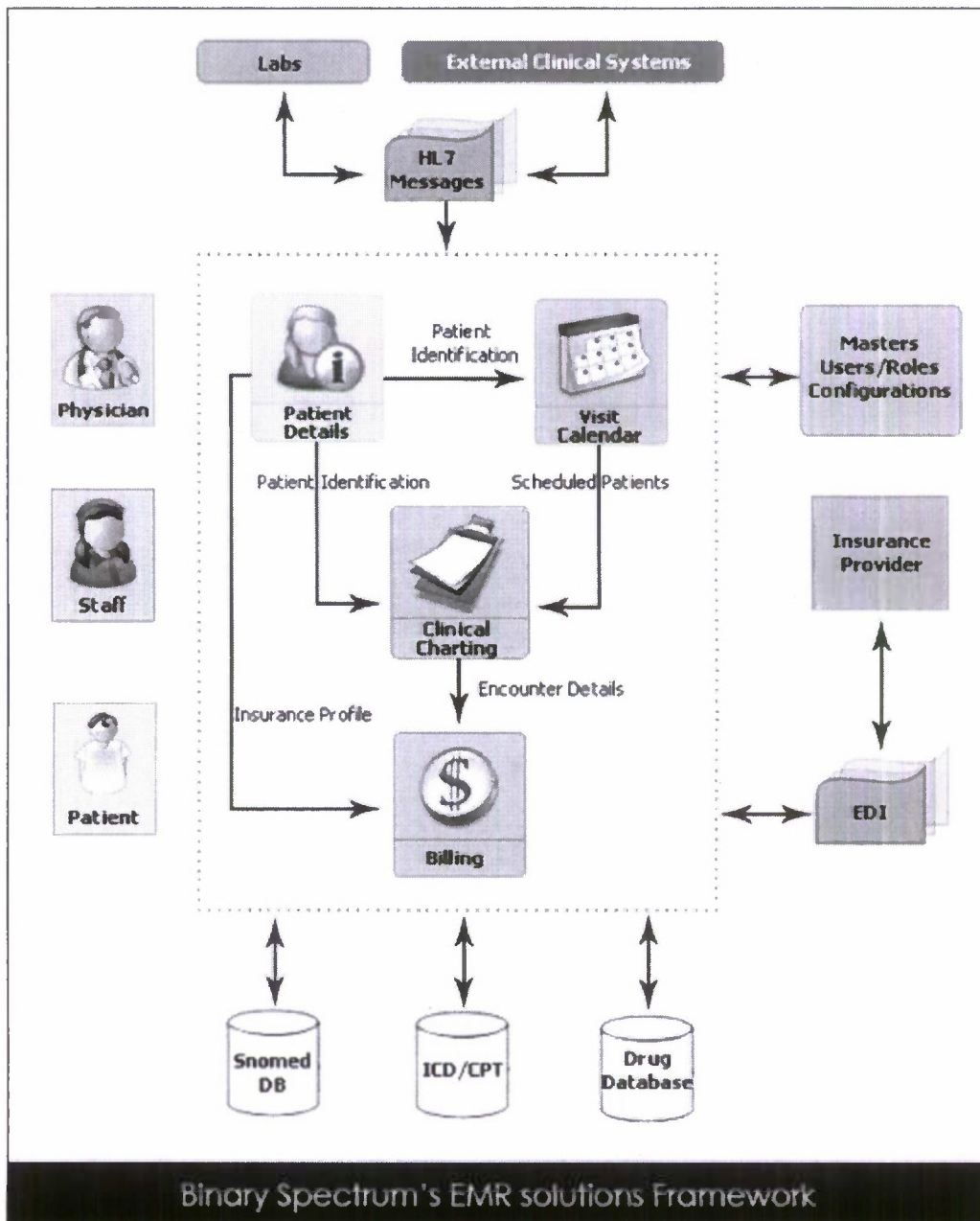


Figure 2. Binary Spectrum's EMR Framework



## **Project Management**

As the organization begins the process of selection and implementing an Electronic Medical Records System, the first step is to identify of an individual to head the implementation project and a team to execute the plan. This begins with the selection of a Project Manager. The Project Manager must have the management and technical skills required to facilitate the complex operation of changing the healthcare organization from a paper records system to an electronic records system. Often times, a large practice will assign or hire a short-term Project Manager. Almost as often, small organizations ask the current office manager or an eager staff member to take on the assignment. However, depending on the workload of the practice, this may or may not be a good decision.

As seen in the literature, the Florida Neurological Group in Ft. Myers, Florida attributes the success of their EMR implementation to the fact they hired a full-time project manager who was dedicated to the implementation process.<sup>23</sup> This individual was completely focused on all issues relating to the needs of the practice from technology to training to conversion. The management felt that this was a key success factor. There are a multitude and variety of tasks that an EMR Project Manger must focus their attention on during the implementation process. The following is in no way an all inclusive list of the duties of the Project Manager for an EMR implementation.

**1. Development of a scanning policy.** The organization must establish a scanning policy for the current paper records. The Project Manager will request that the supervising physician review the paper chart. Once identified, only the files marked as essential for patient care will be scanned into the new EMR system. Planning and coordination is important as this process can take several months to accomplish. During



this transition period, the organization will maintain both paper and electronic records for patients. This is the same method that the Mayo Clinic in Phoenix Arizona used <sup>(Amy Vrabel,</sup>

personal communication, December 4-6, 2007).

In spending time in conversation with the Mayo Clinic Chief Information Officer, she stated that the identification of records to bring forward was key in their successful implementation of their Cerner based EMR.

**2. Create a shared need.** Another vital element in the successful implementation of the Electronic Medical Records System is the “buy-in” of all the stakeholders. These stakeholders included Physicians, Administrators, and individual users of the system. This is critical for the Project Manager as the physicians are perceived as the primary resistor in the implementation of an EMR system. Whether it is their lack of knowledge of the technology, their resistance to change in general, or their feeling of loss of control, the stakeholders must be **willing** to work with the new system. Then and only then will the project manager be able to facilitate this change.

**3. Analyze workflow.** One of the most important jobs of the Project Manager is to examine each function of every job to understand how tasks were accomplished with the old system. The project team will then spend a considerable amount of time analyzing existing work flow processes while looking for opportunities for improved efficiency and designing new work flows that could be accomplished with the tools available in the EMR system and developing a transition plan. There must be regular meetings between the Project Team and the department points of contact during the implementation process. Key leaders from all sections including office and medical staff should discuss and make plans for necessary changes in work flow that would make the best use of the EMR system.

**4. Develop an implementation plan.** The project team will begin the implementation of the EMR in “phases”. At each phase of the implementation process, milestones will be established. Only with the successful completion of each milestone can we move on to the next phase of implementation. First to be brought onboard when the organization goes live will be the most enthusiastic physicians. These doctors tend to be more forgiving of the issues that are inevitable in a new system. After the system is in use and the “kinks” are eliminated, the remainder of physicians will be integrated.

**5. Facilitate third-party interfaces.** The majority of EMR systems support interfaces for lab, PACS, multiple diagnostic devices, and practice management systems. These systems can incorporate third party applications such as Microsoft Outlook for communication with referring providers, pharmacies, hospitals, etc. Contracting for building, testing, and maintaining these interfaces require tremendous attention. Future functionality of EMR Systems can include e-prescribing, patient email and patient portal access. Another example would be the provider enters all data on the encounter directly into the EMR using PCs located in every exam room and only dictates the HPI and comments when needed with voice recognition tools (Dragon Medically Speaking 9.0). Using this third party application, there are times when patient leaves exam room with transcribed notes in their hand. The Project Manager will continue to monitor the integration of these third party applications.

**6. Template development.** Most (85-90%)<sup>23</sup> of physician note entry is template driven. These templates are modified from the initial vendor-supplied material or developed by the practice themselves. There are no provider-specific templates as these would be too cumbersome to maintain. It is the job of the project team, working with

physicians and administration, to come to complete agreement as to what the templates would look like.

**7. Training.** Each and every person in the organization will be affected by the EMR. However, each person is affected in a different way and must be trained in respect to their duty position. The Project Manager will develop an in-house training program, with the help of the organization's education department, for the organization to use well beyond the go-live date. The training plan will be developed in partnership with the EMR vendor to ensure that the program of instruction is as accurate as possible in relation to the software functions. .

## **Implementation**

### **What to Do with the Patient Record**

Planning for a new electronic patient record generally begins with a discussion about what to do with the old paper record. This is a complicated decision based on numerous factors. The following example is how two healthcare facilities moved data from the paper record into an electronic one. Generally speaking, this is done via a mix of scanning and abstracting.

One of the obvious benefits of implementing an EMR system is the elimination of the paper-based patient charts and all of the costs and inefficiencies associated with them. When the Roswell Pediatric Center in Alpharetta, Georgia implemented a Noteworthy Medical Systems EMR in 2001, they worked with an implementation team to plan and execute a transition from paper-based to electronic charts for their patients, all 38,000 of them.<sup>19</sup> Once the transition was complete, Roswell was able to ship all paper-based charts to an off site storage facility. Roswell's transition was carefully planned and

coordinated. The first step was determining which information to enter by hand and which could be simply scanned into the EMR. To make this decision, the implementation team identified the information necessary for the EMR system to provide clinical decision support. A Critical Data Checklist (CDC) was created that identified the items to be scanned or hand-entered into the system. The committee identified immunization history, allergies, current medications and growth histories, among other items. It was important that these items be entered into the Noteworthy EMR and stored in structured database format so that Roswell could take full advantage of well-care reminders, immunization forms, and growth graphs that had been set up in the system.

The Mayo Clinic in Phoenix, Arizona conducted the same type of analysis. Once the Mayo decided on Cerner as their EMR system, the Administration asked the physicians to do a patient by patient review of their medical records. The selection of data to be brought forward was a bit different. The Mayo established the policy that they would not bring any old data forward into the new system unless it was directly related to an ongoing procedure. Then, if the data was relevant, it was scanned into the Cerner EMR and stored in a database for future use. The providers can not go back and make changes to this data but they can go back and review the patient information. All data from this point forward is entered into their EMR system electronically <sup>(Amy Vrabel, personal communication,</sup>

December 4-6, 2007).

Once the healthcare providers, in both scenarios, were convinced that all pertinent information had been entered, he or she approved the Critical Data Checklist and from that point on, only the electronic chart was used for that patient. In total, the process of pulling paper-based charts prior to patient appointments and use of the Critical Data



Checklist lasted several months for both facilities. This is the same type of procedure that will be used in establishing the organizations scanning and abstract policy.

### **Appropriate Technology**

Other critical decisions made early in the life of the project concern the type of technology that will support the EMR. At present, there is no an established criterion or footprint for an organization implementing an EMR system. Each organization must develop an individual framework for adoption and implementation. To accomplish this, the organization will require the help and expertise of information technology professionals to ensure that the current network technology is of sufficient quality to support the EMR system and to establish safe and secure practices for maintaining highly confidential patient data. If the current network is insufficient to handle this data push, plans must be made for a core network upgrade. In identifying the personnel to conduct this analysis and possible upgrade, the best case scenario would be pulling from internal staff, in-sourcing, to accomplish this task. In the event we can not, the organization must look to an outside consultant to provide this. These personnel costs must be factored into the lifecycle operating cost of the system.

### **Infrastructure**

The organization, in an attempt to reduce the cost of system implementation, will use the "Server to Dumb Terminal" method to deliver the EMR to the users. Two blade servers will host the EMR systems with two additional servers as a redundant backup. All the EMR applications will be hosted on these production servers. This type of environment, known as a thin-client environment, involves installing all applications on a centralized server and accessing the servers with a thin-client device or "dumb-terminal."



The management of this thin-client environment is very efficient, as there is no need to load the EMR application on every user's device. Instead, the application is loaded one time on the server and is immediately accessible to all users who log on to the network.

This type of network can result in considerable cost and time savings. The requirement for individual PCs are eliminated and they are replaced with thin-clients or dumb terminals. Thin-client devices generally cost less than PCs, and there is less time spent loading every application on every device. Maintaining thin-clients are also more efficient than individual PCs. If a thin client goes out, it is simply replaced with another. There is no need to reload or re-image the system as the applications are being pulled from the EMR application server.

The one exception to this infrastructure design will be the equipment issued to the providers. Instead of setting up dumb terminals in the exam rooms, physicians will each be issued wireless-tablet PCs. This will reduce the risk of patients or children tampering with the equipment. The providers PCs will connect wirelessly to the facility network, thus allowing the providers to freely move throughout the facility without having to consistently log on and off of the system.

### **Configuration**

One of the greatest time consumers in the implementation of an Electronic Medical Records System is the time it takes to configure the system. Webster's Dictionary defines "configuration" as:

- relative arrangement of parts or elements
- To set the basic parameters
- the stable structural makeup

As we begin implementing the EMR System, some of the basic configuration tasks include, but are not limited to:<sup>23</sup>

- Importing a list of local pharmacies (addresses, telephone and fax numbers) and referring physicians;
- Modifying (adding, changing or deleting) the chief complaint or reason for visit descriptors to match your practice or specialty type;
- Defaulting a common physical exam (sometimes building different types of exams; for example, a “short” and “long” or “male” and “female” exam, “well-woman” or “well-child”);
- Building protocols filled with common order sets;
- Scanning paper notes from the patient’s paper record;
- Abstracting key data points for the physician’s ease at go-live (for example, medication and allergy list, problem list and past medical and family/social history);
- Building the descriptive tags for a lab or radiology interface;
- Scanning physician signatures for the bottom of notes and prescriptions;
- Determining and building security settings, meaning which user logons have access to which parts of the patient record and also, which logons can perform what functions within the EMR (for example, who can “write” a prescription, sign a note, delete a record, change a template?)

Depending on the EMR product and what modules and application that the organization will purchase, the amount and degree of customization will vary. With this variation, we could be looking at anywhere from days to months to configure. This is one of the hardest concepts to grasp by the organization. The configuration will be a corporate effort on the organization. The IT Department will work closely with physicians and administrators to configure the new system in a way that is the most efficient and productive for the facility. This will all be done in-house. The software vendor does not actually configure the system.

We must not underestimate the time that it will take us to configure the Electronic Medical Records System. Failure to allocate the appropriate amount of time could delay our “go live” date.

## **Routine Upgrades**

As this project continues through its lifecycle, we must continually budget resources and time for routine software upgrades to keep the EMR current. There is no system on the market today that does not go through continued development and improvement processes. These modifications will be forwarded to us in the form of patches and updates. Without these continued upgrades, the organization will limit the features and functions that may become available such as e-prescribing, voice recognition, EMR-based messaging and tasking, and various interfaces (such as lab, diagnostic equipment, and billing).

## **Training Needs**

As we continue to develop the EMR infrastructure and configure the system, the organization must begin training the users of the system and continue to train the users and technicians throughout the lifecycle of the product.

*Knowing is not enough; we must apply.  
Willing is not enough; we must do.  
-Goethe*

Vendor training is expensive. Not only do vendors charge highly competitive consulting rates for the training (currently ranging from \$250-\$400 per hour), the costs for the trainers travel and lodging expenses will be added to the bill. We must actively search for EMR products that offer a comprehensive training plan upfront so that we can compare training packages with other vendors. Additional services or fees such as after-hours support desk calls, travel expenses, on-line training materials and videos, additional copies of training manuals, and no-cost web-ex seminars can be negotiated along with the purchase price.

We must then negotiate with the vendor in the development of some type of “Train the Trainer” program. This will allow the organization to provide a continual training program to the physicians and staff with minimal intervention and costs from the vendor.

### **The Case for Quality**

Healthcare organizations pursue the adoption of an Electronic Medical Records System for various reasons. Two of the most common reasons are the increased efficiency and improved quality of care. There is an enormous amount of data that is captured in an Electronic Medical Records System. In order to effectively manage this data, a defined set of indicators is required so that the same indicators can be repeatedly measured over time. This data is used internally and is also sent to external quality control organizations. Feedback from these data benchmarks is furnished to each provider so they know if they are providing care consistent with current guidelines. The feedback can lead to performance improvement, which means our patients ultimately receive a higher standard of care, and in the best scenario, experience fewer clinical events requiring intervention.

Efforts to improve the organization’s competitiveness are critical and the EMR is but one tool to help enable that improvement. A healthcare organization can also leverage the capability of the EMR to support their clinical research efforts. The EMR helps to identify potential candidates to include in planned studies. The provider is contacted to see if the candidate patient could be contacted about participating in the study. This allows an organization to identify research participants with much less burden and paperwork during the normal course of caring for patients.



There is still some debate about what record management model is better for the provider; paper or digital. However, there is really no debate about which model enables better care for the patient but it does require the providers to change the way they organize and access information. For some, that change is very hard to accomplish, but from those providers who have done it, they say it is worth the effort.

### **Return on Investment**

Although most healthcare organizations will not share the actual financial on how much an Electronic Medical Records System has saved them, most have noted a substantial savings in the long run with the adoption of an EMR. Generally speaking, cost savings can be divided into the following categories:

**Transcription.** The cost savings from transcription, especially in the specialist's offices were significant, often coming close to nearly one million dollars a year in large practices.

**Medical records space.** Medical office building rent per square foot is costlier than other storage options, and the space no longer needed for storing charts can be used to generate revenue. This additional revenue can and will usually help to off-set the cost of the EMR system. In addition, there are frequently lower costs of rental storage and retrieval of off-site records.

**Paper chart costs.** Office Managers in medical facilities know that the cost of supplies, particularly medical charts and tab, has increased dramatically over the years. Eliminating charts and chart supplies is a cost savings in itself.

**Staffing costs.** Fewer records clerks are required to transport, file and manage paper with EMR. Report writing and data collection becomes automated and billing



practices are simplified. The employees can be retrained into other revenue generating positions.

Others have written about the return on investment for practices investing in EHR and have made conclusions similar to the practices interviewed for this paper, suggesting that the annual revenue enhancement can be as much as \$30,000 per physician.<sup>24-26</sup>

### **Conclusion**

The Electronic Medical Record is a secured electronic file of patient history, medical transcription notes, billing information, and all other information necessary to have a complete patient profile. It is true that the electronic medical record is indicative of a faster-paced informational age in which larger quantities of information require more effective database infrastructure, but there are many more benefits to both the medical service provider and the consumer. This paper identifies numerous benefits of an electronic medical record of which both practices and patients need to be aware.

With approximately 25% of the medical community claiming to have some implementation experience with an EMR system, learning about EMR options has become simpler over the years. The promise of Electronic Medical Records continues to be compelling for several reasons: namely enhanced patient safety, improved provider efficiency, and increased enterprise productivity. While choosing the right product is definitely a critical success factor, this paper proposes that designing the right implementation plan is also critical to the success of the EMR project. From the literature review and personal experience, it is apparent that purchasing a good software and hardware system is not enough. An organization must go through the tedious task of preparing the technical infrastructure, managing a complex implementation, configuring

the system to a physician's exact specifications, training on a highly technical product, and finally, surviving the "go-live" day. Then and only then will we be able to say we have successfully adopted the Electronic Medical Record.

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## Appendix A. EMR Definitions

**CCHIT:** Certification Commission for Healthcare Information Technology. CCHIT is the recognized certification authority for electronic health record systems.

**Client(s):** A client is the requesting program or the user's computer in a client/server relationship

**CMR:** (*computerized medical record*) - Any document imaging-based system

**CPR:** (*computer-based patient record*) - Lifetime patient record that includes all information from all specialties (even dentist, psychiatrist) and requires full interoperability

**Database:** A mechanism for organizing the data in an EMR, EHR, and PMS.

**DMR:** (*digital medical record*) - Web-based patient record using "pull" technology (minimum of messages)

**EHR:** Electronic Health Record. A longitudinal digital record intended to interact with systems outside the office, ie. lab facilities and government agencies.

**EMR:** (*Electronic Medical Record*) - Generic term for all electronic patient care systems. Electronic record with full interoperability within an enterprise (hospital, clinic, practice)

**EPR:** (*electronic patient record*) - Similar to CPR but not necessarily containing a lifetime record and not including dental, behavioral, or alternative care; focuses on relevant information

**IT:** Information Technology

**P4P:** Pay for Performance.

**PCR:** (*patient-carried record*) - All information contained on a token or card that patient carries

**PHI:** (protected health information) – Information, in electronic or written format, that must be protected from unauthorized access

**PHR:** (*personal health record*) - Managed and controlled by patient, mostly Web-based

**Physician Portal:** A Web-based communication method between physicians and patients.

**PMS:** Practice Management System. Software generally used for billing purposes.



**POE:** (physician order entry) – The physician enters orders in this system. The orders are available at the required departments

**Server:** In the client/server programming model, a server is a program that awaits and fulfills requests from client programs in the same or other computers. A given application in a computer may function as a client with requests for services from other programs and also as a *server* of requests from other programs.

## APPENDIX B: EMR Functional Requirements

Electronic Medical Record (EMR) Functional Requirements VERSION 5.2 9.2.2004						
Requirement	Vendor Capabilities			Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
	Min	Opt	Yes			
<b>1. General</b>						
A. The system supports both a total paperless function and a hybrid function, where the contents of the electronic record can be printed for inclusion in the paper chart						
B. The system links with a variety of digital and analog dictation systems						
C. The system date and time stamps all entries						
D. The system includes automatic translation of codes to data. For example:						
• ICD-9-CM						
• CPT (4 and 5)						
• ICD-10						
• SNOMED (II and III)						
• APG						
• NDC						
E. The system includes support and updates for the above vocabularies						
F. The system supports local, regional, and national vocabularies, updates and enhancements						
G. The system supports the HIPAA Standards for Electronic Transactions						
H. The system includes the integration of third party coding programs						
I. The system includes extensive error checking of all user input data, including, but not limited to:						
• ICD-9 (Check diagnosis against gender, age, other as necessary)						
• ICD-9 procedure checking against diagnosis						
Extensive date checking for validity as well as ensuring a valid chronological order of events (dx before treatment, scheduling after birth, etc.)						

LEGEND: MIN =REQUIRED OPT=OPTIONAL

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## Electronic Medical Record (EMR) Functional Requirements

VERSION 5.2 9.2.2004

				Vendor Capabilities		
Requirement	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
J. The system includes an integrated standard nomenclature of clinical terms.						
K. The system provides sufficient storage and processing power to efficiently operate on the initial patient load plus 5% yearly growth for five (5) years without additional hardware						
<a href="#">Table of Contents</a>						
<b>2. Demographics</b>						
A. The system has the capability of importing patient demographic data via HL7 interface from an existing Practice Management System, Patient Registration System, or any such system used for patient registration and/or scheduling						
B. The system has the capability to import/create, review, update, and delete patient demographic information as well as other non-clinical information from the patient record						
C. The system captures permanent patient address						
D. The system captures temporary patient addresses						
<a href="#">Table of Contents</a>						
<b>3. Medical History</b>						
A. The system supports rapid capture of patient history and physical exam data						
B. For each new patient, the system captures and stores risk factors. For example:						
• Tobacco use and history including number of years and packs per day (PPD)						
• Alcohol use, history						
• Drug use, history						
• Occupational environment						
C. For each new patient, the system captures and stores the following social history elements:						
• Marital status						
• Occupation						
LEGEND: MIN =REQUIRED OPT=OPTIONAL				PAGE 5 OF 25		
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## Electronic Medical Record (EMR) Functional Requirements

VERSION 5.2 9.2.2004

Requirement	Min	Opt	Yes	Vendor Capabilities		
				Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
• Religious preference	•					
• Socioeconomic status	•					
• Native language	•					
• Translator needed (Y/N)	•					
D. The system has the capability to import patient health history data, including obstetrical history data, from an existing system.	•					
E. The system documents hospitalization data including:						
• Admission and Discharge dates	•					
• Chief complaint	•					
• Admitting diagnosis / Other diagnoses	•					
• Procedures performed	•					
• Discharge summary	•					
• Discharge disposition	•					
F. The system documents all existing allergies, such as:						
• Drug	•					
• Food	•					
• Drug-drug	•					
• Drug-food	•					
G. The system captures history of received immunizations.						
H. The system has the capability of linking or grouping records of other family members on file.						
I. The system has the capability to capture and store genograms						
J. The system collects and stores family history, including, but not limited to:						
• History of chronic diseases, including date of diagnosis	•					
• Disease status	•					

LEGEND: MIN =REQUIRED OPT=OPTIONAL

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## Electronic Medical Record (EMR) Functional Requirements

VERSION 5.2 9.2.2004

Requirement	Vendor Capabilities					
	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
<ul style="list-style-type: none"><li>Family member functional status</li></ul>						
<ul style="list-style-type: none"><li>If dead: date and cause of death</li></ul>						
<a href="#">Table of Contents</a>						
<b>4. Current Health Data, Encounters, Health Risk Appraisal</b>						
A. The system obtains test results from laboratory, radiology / imaging, or other equipment or technology related procedures via standard HL7 interface.						
B. The system has the capability to import/create, review, and amend information about the patient's condition obtained from laboratory, radiology/imaging, or other equipment or technology-related tests and/or procedures.						
C. The system has the capability to capture and monitor patient health risk factors in a standard format.						
D. The system shall display encounter data using a problem-oriented format.						
E. The system supports online completion of the Health Survey (SF-36) or similar measure for measuring health status and outcomes						
F. The system includes plotter support capability.						
G. The system supports the capture, graphic display and plotting of "Growth Chart" information, as well as other forms requiring graphic representation.						
H. The system has the capability of reproducing and displaying a variety of end user patient and treatment forms.						
I. The system has the capability to update other portions of the record with captured vital signs data. At minimum, the system collects:						
<ul style="list-style-type: none"><li>Height</li></ul>						
<ul style="list-style-type: none"><li>Weight</li></ul>						
<ul style="list-style-type: none"><li>Pulse</li></ul>						
<ul style="list-style-type: none"><li>Respiratory rate</li></ul>						

LEGEND: MIN =REQUIRED OPT=OPTIONAL

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SHADED AREAS FOR INTERNAL USE ONLY

**Electronic Medical Record (EMR)****Functional Requirements**

VERSION 5.2 9.2.2004

Requirement	Vendor Capabilities			Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
	Min	Opt	Yes			
• Blood pressure (including multiples)						
• Different position blood pressure						
• Other						
J. The system incorporates one or more accepted measure of functional level.						
K. The system supports at least one standard health status measure.						
L. The system stores automatic measurements of health status.						
M. The system has the capability to import/create, review, update, and amend health data (objective and subjective) regarding the patient's current health status, including (as applicable):						
• Chief complaint						
• Onset of symptoms						
• Injury mechanism						
• Physical examination findings						
• Psychological and social assessment findings						
N. The system provides a flexible mechanism for retrieval of encounter information that can be organized in variety of 'views'. For example:						
• By name (last, first; first, last; etc.)						
• By date of birth						
• Chronological by encounter date						
• By diagnosis, problem, problem type						
• By chart number						
• By family group / linkage						
O. The system provides a flexible, user modifiable, search mechanism for retrieval of information captured during encounter documentation.						
P. The system provides a mechanism to capture, review, or amend history of current illness.						

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	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
Q. The system ensures dynamic documentation during the encounter complying with all standard coding rules						
R. The system captures the following referral information:						
• Type of referral						
• Date						
• Reason						
• Provider						
S. The system tracks consultations and referrals						
T. The system has the capability of printing consultations / referrals forms						
<a href="#">Table of Contents</a>						
<b>5. Encounter – Progress Notes</b>						
A. The system records progress notes utilizing a combination of system default, provider customizable, and provider-defined templates.						
B. The system has the capability to automatically update other sections of the record with data entered in the progress note						
C. The system requires that the progress note be electronically signed at the end of the encounter prior to being allowed to continue						
D. The encounter - progress note template includes space for entering performed and planned procedures. It also includes:						
• Performed/planned Laboratory procedures						
• Diagnosis						
• Goals (provider's and patient's) and follow-up plans						
• Medications prescribed						
• Patient education materials						
• Consultation/referrals						
<p>LEGEND: MIN =REQUIRED OPT=OPTIONAL</p> <p style="text-align: right;">PAGE 9 OF 25</p> <p style="text-align: center;">SHADED AREAS FOR INTERNAL USE ONLY</p>						



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Requirement	Vendor Capabilities			Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
	Min	Opt	Yes			
• Patient condition or status						
E. The system includes a progress note template that is problem oriented and can, at the user's option be linked to either a diagnosis or problem number.						
F. The system has the capability of retrieving encounters by a variety of user-defined parameters.						
G. The system enables standard phrases to be defined/contained in tables and used as pull down menus to reduce the key entry effort.						
H. The system automatically captures the electronic signature and title of the person entering data and date/time stamps each transaction.						
I. The system enables progress notes to be sorted for viewing in chronological or reverse chronological order by encounter date in relation to the active care plan.						
J. The system applies security controls to progress notes to ensure that data cannot be deleted or altered except within the current session and by an authorized user.						
K. The system includes a medical terminology dictionary and a spell checker within the progress notes data entry module.						
L. The system supports the capability to automatically collect the data elements defined by the associated clinical practice guideline or order.						
<a href="#">Table of Contents</a>						
<b>6. Problem Lists</b>						
A. The system provides a problem status for each shown problem.						
B. The system organizes applicable patient data into comprehensive problem summary lists.						
C. The system provides problem descriptions based on the following standard controlled						
<p>LEGEND: MIN =REQUIRED OPT=OPTIONAL</p> <p style="text-align: center;">SHADED AREAS FOR INTERNAL USE ONLY</p>						

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Requirement	Vendor Capabilities					
	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
vocabularies:						
• SNOMED III						
• SNOMED RT						
• MEDCIN						
• 3M						
• ULMS						
D. The system separates active from inactive problems.						
E. The system allows clinicians to identify and record new patient problems as well as the current status of existing problems.						
F. The system expands the problem summary list on demand.						
G. The system enables the monitoring of health risk factors.						
H. The system updates the active problem list from relevant data in the progress note.						
I. The system records the patient's current health status collected in a standard format.						
J. When capturing problem information, the system captures:						
• Diagnosis / problem date(s)						
• Severity of illness						
K. For each problem, the system has the capability to create, review, or amend information regarding a change on the status of a problem to include, but not be limited to, the date the change was first noticed or diagnosed.						
L. The system archives problems complete with status history						
M. The system continually updates the diagnosis/problem lists with the capture of each new piece of patient data in any module						
N. The system automatically links problems with order and results						

LEGEND: MIN =REQUIRED OPT=OPTIONAL

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Vendor Capabilities						
Requirement	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
O. The system automatically updates the problem summary lists using approved rules-based guidelines						
P. The system has the capability of allowing the display of past interventions, hospitalizations, diagnostic procedures, and therapies for review at the option of the provider						
Q. The system meets RBRVS/E&M documentation and coding guidelines						
R. The system automatically updates the problem summary lists upon detecting changes made to multi-disciplinary guidelines.						
<a href="#">Table of Contents</a>						
<b>7. Clinical Practice Guidelines (CPG)</b>						
A. The system includes standard Clinical Practice Guidelines (CPG) from the National Guideline Clearinghouse, a public resource for evidence-based clinical practice guidelines. NGC is sponsored by the Agency for Healthcare Research and Quality (formerly the Agency for Health Care Policy and Research).						
B. The system has the capability of allowing initial authoring and revising of clinical practice guidelines						
C. The system allows linkages from the CPG to other system modules.						
D. The CPG module imports/creates the facility for rapid documentation of the patient's progress along the CPG's phases.						
E. The format utilized by the guideline for documenting is intuitive, easy to use, and user customizable.						
F. The CPG module utilizes pull down menus and check boxes to speed up data entry.						
G. Optionally, the CPG module can be populated by data entered elsewhere in the system.						
H. The system allows reporting and analysis of any						
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Requirement	Vendor Capabilities					
	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
/ all components included in the CPG.						
I. Included in each CPG, the system has the capability to create, review, and update information about:						
• The performance measures that will be used to monitor the attainment of objectives						
• The quantitative and qualitative data to be collected						
• Performance metrics						
• Collection means and origin of data to be evaluated						
J. The system allows the provider or other authorized user to override any or all parts of the guideline.						
<a href="#">Table of Contents</a>						
<b>8. Care Plan</b>						
A. The system has the capability to import/create, review, and amend information about the desired single or multi-disciplinary long / short term goals and objectives that will be accompanied by the care plan.						
B. The system has the capability to import/create, review, and amend information about the proposed set of single or multi-disciplinary care plan options that are based upon expected outcomes.						
C. The system has the capability to import/create, review, and amend information about:						
• The provider's explanation and the patient's or patient representative's understanding of the recommended and/or alternative care plan options.						
• The medical orders, which authorize the execution of the selected, care plan.						
• The collection of specimens (body fluids, tissue, etc.) from the patient to be used for diagnostic or treatment purposes.						
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Requirement	Vendor Capabilities			Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
	Min	Opt	Yes			
<ul style="list-style-type: none"> <li>The actions taken to safeguard the patient to avert the occurrence of morbidity, trauma, infection, or condition deterioration.</li> </ul> <a href="#">Table of Contents</a>						
<b>9. Prevention</b>						
A. The system has the capability to display prevention prompts on the summary display.						
B. The system allows interactive prevention status documentation. At minimum:						
<ul style="list-style-type: none"> <li>Date addressed</li> </ul>						
<ul style="list-style-type: none"> <li>Result</li> </ul>						
<ul style="list-style-type: none"> <li>Reasons for not performed</li> </ul>						
<ul style="list-style-type: none"> <li>Where performed</li> </ul>						
C. The system includes user-modifiable health maintenance templates.						
D. The system includes a patient tracking and reminder capability (patient follow-up).						
E. The system allows the graphing of pertinent data into flow sheets for presentation/display.						
F. The system includes the incorporation of immunization protocols:						
<ul style="list-style-type: none"> <li>Universal child</li> </ul>						
<ul style="list-style-type: none"> <li>Universal adult</li> </ul>						
<ul style="list-style-type: none"> <li>Specific foreign travel</li> </ul>						
<a href="#">Table of Contents</a>						
<b>10. Patient Education</b>						
A. The system has the capability to create, review, update, or delete patient education materials						
B. The system has the capability of providing printed patient education materials in culturally appropriate languages on demand or automatically at the end of the encounter						
C. The system includes or the capability to develop						

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Requirement	Vendor Capabilities					
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patient instructions for a broad range of treatments and services delivered by providers. Examples:						
• Care of wound						
• Exercise regimen						
• Diet guidelines						
• Administration and care of medications						
D. The system allows patient instructions to be selected from a pull down list.						
E. The system allows user modifications to instructions to suit individual patient needs without altering the original content.						
F. The system enables the linkage of patient instructions to care plans/care maps/ practice guidelines/orders, enabling automatic printing.						
G. The system allows patient instructions to be printed on demand independent of care plans/care maps/guidelines/orders						
H. The system includes the facility to create a directory of information for patient support groups and to include any applicable support group information in the instructions						
<u>Table of Contents</u>						
<b>11. Alerts</b>						
A. The system includes user customizable alert screens / messages, enabling capture of alert details, including, but not being limited to:						
• Text describing the alert						
• Date and time of the alert						
B. The system prints an alert on demand						
C. The system has the capability of forwarding the alert to a specific provider(s) or other authorized users via secure electronic mail or by other means of secure electronic communications						
<p style="text-align: center;">LEGEND: MIN =REQUIRED OPT=OPTIONAL</p> <p style="text-align: center;">PAGE 15 OF 25</p> <p style="text-align: center;">SHADED AREAS FOR INTERNAL USE ONLY</p>						

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Requirement	Vendor Capabilities					
	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
12. Orders						
A. The system includes an electronic Order Entry module that has the capability to be interfaced with a number of key systems depending on the health center's existing and future systems as well as external linkages, through a standard, real time, HL7 two-way interface.						
B. The system has the capability to print orders for manual transmission						
C. The system has the capability to fax orders.						
D. The system has the capability to require that all orders be digitally signed at the completion of each order.						
E. The system accepts orders from multiple locations.						
F. The system has the capability to assign and display an order number for active, hold, and pending orders.						
G. During the order entry process, the system has the capability to require the user to acknowledge an error message prior to being allowed to continue with the data entry function.						
H. The system allows the user to accept, override, or cancel an order.						
I. The system requires the user to enter a justification for overriding, changing, or canceling an order prior to be allowed to continue						
J. The system includes the visual indication of orders in need of review.						
K. The system detects and displays duplicate orders issuing visual and auditory warnings, and allows the user to override the warning after entering a justification for the override.						
L. The system includes the capability to:						
• Define order sets for each provider or service department.						

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Requirement	Vendor Capabilities					
	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
<ul style="list-style-type: none"> <li>Contain all information specific to one order in one display screen.</li> </ul>						
<ul style="list-style-type: none"> <li>Include a pull-down list of all order departments to enable multiple orders</li> </ul>						
<ul style="list-style-type: none"> <li>Include a user-configurable / customizable pull-down list of tests and services from which to place one or more orders.</li> </ul>						
M. The system has the capability of displaying the most commonly used orders to assist in order placement.						
N. The system can display all order sets including components, by any of the following:						
<ul style="list-style-type: none"> <li>By procedure</li> </ul>						
<ul style="list-style-type: none"> <li>By provider</li> </ul>						
<ul style="list-style-type: none"> <li>By diagnosis</li> </ul>						
<ul style="list-style-type: none"> <li>By date</li> </ul>						
O. The system has the capability to specify/display exploding orders						
P. The system has the capability to enable selected orders to be recurring orders.						
Q. The system includes an order inquiry mechanism to allow providers to inquire on the details of an order.						
R. The order inquiry function is accessible within the order entry flow before the session is terminated.						
S. An order, at the user's option, displays all the detail data associated with the order, including demographics, order parameters, electronic signatures, and order status						
T. The system displays order summaries on demand to allow the clinician to review/correct all orders prior to transmitting/printing the orders for processing by the receiving entity						
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Requirement	Min Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
13. Results					
A. The system accepts results via two way HL7 interface from all HL7 compliant / capable entities or through direct data entry. Specifically – Laboratory, Radiology, and Pharmacy information systems.					
B. The system includes an intuitive, user customizable results entry screen linked to orders					
C. The system displays results in a customizable, intuitive, and flexible format					
D. The system allows authorized users to copy selected results into a note					
E. When displaying results, the system, at a minimum, displays the patient name, date and time of order, date and time results were last updated, as well as any alerts identifying changes/amendments to the test or procedure, and test name					
F. The system uses visual cues to highlight abnormal results					
<a href="#">Table of Contents</a>					
14. Medications					
A. The medication module includes access to the National Drug Classification (NDC) database					
B. The system stores common prescriptions for quick entry.					
C. The systems supports multiple drug formularies and prescribing guidelines					
D. The system has the ability to update the progress note with prescription information					
E. The system allows the provider the ability to document the effectiveness or ineffectiveness of a medication.					
F. The system stores refill and repeat prescription information					
G. The system allows storage of prescription data					
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	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
for retrieval by any or the following:						
• Drug name						
• Drug code number (NDC)						
• Amount prescribed						
• Schedule						
H. The system provides the following drug/prescription order information:						
• Drug contraindication						
• Active problem interactions						
• Check that appropriate studies are obtained						
I. The system provides extensive drug interaction information:						
• Drug-drug						
• Drug-allergy						
• Drug-symptom						
J. The system allows the provider the ability to prioritize / rank the importance of the interactions and/or warnings.						
<a href="#">Table of Contents</a>						
<b>15. Confidentiality and Security</b>						
A. The system supports biosensor technology for logon.						
B. Supports industry standard electronic signatures.						
C. The system controls access to and within the system at multiple levels (e.g. per user, per user role, per area, per section of the chart) through a consistent mechanism of identification and authentication of all users in accordance with the 'Role Based Access Control' (RBAC) standard.						
D. The system establishes patient/physician data element confidentiality.						
E. The system allows access to its modules regardless of location based on confidentiality and security procedures.						
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Vendor Capabilities						
Requirement	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
F. The system incorporates audit trails of each access to specific data.						
G. The system incorporates an audit trail for all system transactions including look-ups of patient data.						
H. Provides automatic analysis of audit trails and unauthorized access attempts.						
I. Runs under B-2 or above rated operating system.						
<a href="#">Table of Contents</a>						
<b>16. Decision Support</b>						
A. The system includes access to medical research and literature databases such as MEDLINE, JAMA, GRATEFUL MED, and others.						
B. The system utilizes health data from all sections of the chart to provide decision support to providers.						
C. The system triggers alerts to providers when individual documented data indicates that critical interventions may be required.						
D. The system automatically triggers an alert upon documentation of a diagnoses or event required to be reportable to outside agencies including the Centers for Disease Control and Prevention (CDC) and State health and mental hygiene departments.						
E. The system automatically triggers and alert upon documentation of patient health data for a member of an existing medical registry or disease management program.						
F. The system's alert/reminder functions are driven by appropriate multi-disciplinary clinical guidelines.						
G. The system allows customized studies to be performed utilizing individual and group health data from the electronic record.						

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Requirement		Vendor Capabilities					
		Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
II. The system incorporates preventive medicine questionnaires to be completed by clinicians and if applicable, patients, during the encounter.							
<a href="#">Table of Contents</a>							
17. Cost Measuring / Quality Assurance							
A. The system has built-in mechanism/access to other systems to capture cost information							
B. The system generates an evaluation survey (scheduled and on-demand) that will record patient satisfaction							
C. The system supports real-time or retrospective trending, analysis, and reporting of clinical, operational, demographic, or other user-specified data							
D. The system produces workload measures							
E. The system produces reports of usage patterns							
F. The system has the capability to perform automatic cost analysis for courses of drug treatments							
G. The system provides the capabilities for users to develop utilization statistical and productivity reports on user-determined data fields							
H. The system provides the capability for authorized users to develop volume statistics reports on user determined data fields							
I. The system has the capability to produce population-based studies based on flexible, end user modifiable criteria.							
J. The system has the capability of producing scheduled and on demand case mix reports.							
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Requirement	Vendor Capabilities					
	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
18. Disease Management / Clinical Registries						
A. The system supports disease management registries by:						
• Allowing patient tracking and follow-up based on user defined diagnoses						
• Integrating all patient information within the system						
• Providing a longitudinal view of the patient medical history						
• Providing intuitive access to patient treatments and outcomes						
B. The system automatically identifies all high-risk patients and notifies clinical staff for preventive care.						
C. The system utilizes user authored and/or third party developed clinical guidelines for disease and registry management						
D. The system tracks / provides reminders and validates care process						
E. The system generates follow-up letters to physicians, consultants, external sources, and patients based on a variety of parameters such as date, time since last event, etc. for the purpose of collecting health data and functional status for the purpose of updating the patient's record						
F. The system links Disease Management functions to all other sections of the EMR						
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Requirement	Vendor Capabilities				
	Min	Opt	Yes	Module Name	3 <sup>rd</sup> Party Provided (Name)
<b>19. Technical</b>					
A. The system auto-populates user defined data fields with patient demographics at the time of order or request					
B. The system is scalable					
C. The system incorporates a consistent user interface for data entry independent of the platform					
D. The system supports a variety of input modalities such as voice recognition, touch screen, light pen, mouse, keyboard, etc.					
E. The system will be accessible and available to all authorized users 99.5% of the time					
F. The system's response time is 2 seconds or less 90% of the time					
G. The system supports a sub second response time 80% of the time					
H. The system supports remote system monitoring technology					
I. The system incorporates extensive, secure telecommunications capabilities that link staff and clinicians from remote locations to the central site					
J. The system supports an industry standard locking mechanism to prevent unauthorized updates					
K. The system supports and implements system redundancy / fault tolerance for 100% availability					
L. The system logs all transactions processing and archiving					
M. The system alerts simultaneous users of each other's presence in the same record					
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## Functional Requirements

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Requirement	Min	Opt	Yes	Vendor Capabilities		
				Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
<b>20. Clinical IT Data Dictionary</b>						
A. The system is structured to support skeleton-to-robust EMR.						
B. Provides attributes for each data element; supports all data types.						
C. Supports static/dynamic data element relationship.						
<u>Table of Contents</u>						
<b>21. Input Mechanisms</b>						
A. The system supports a full range of input technologies.						
B. Input protocol is easy/fast; intuitive input interface.						
C. The system capitalizes on the "repetitive nature of medicine".						
D. The system has the ability to allow inclusion of free text as well as the capture of discrete data.						
<u>Table of Contents</u>						
<b>23. Ergonomic Presentation</b>						
A. The system places emphasis on user friendliness						
B. The system incorporates a consistent presentation of information across the entire system						
C. The system incorporates visual cues						
D. The system provides consistent formatting to aid users in finding information						
<u>Table of Contents</u>						
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Requirement	Vendor Capabilities					
	Min	Opt	Yes	Module Name	Future Version (Date)	3 <sup>rd</sup> Party Provided (Name)
24. Implementation and Support						
A. The implementation effort begins with the development of a comprehensive implementation plan developed jointly with the end user.						
A. The implementation plan includes an end-user skills assessment phase to be performed by the vendor						
B. The implementation includes a staff-training phase.						
C. The amount and type of training is derived from the results of the skills assessment phase.						
D. The system package includes support and maintenance of application software and application system upgrades.						
E. The system includes support of networked applications						
Table of Contents						

LEGEND: MIN =REQUIRED OPT=OPTIONAL

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